DESCRIPTION

OPERATIONS PANEL AND IMAGE FORMING

APPARATUS

TECHNICAL FIELD

         The present invention generally relates

to an operations panel and an image forming

apparatus, and particularly relates to an

operations panel having operations blocks for

remotely controlling an electronic apparatus,

such as an electrophotographic image forming

apparatus, and an image forming apparatus having

the operations panel.

BACKGROUND ART

         Electronic apparatuses, such as copying

machines, fax machines, printers, and

multifunction machines, include operations

sections as user interfaces, which are

configured such that users can easily use many

functions. Most of the operations sections are

fixed to main bodies of the electronic

apparatuses. The users use the operations

sections according to operating procedures shown

on the operations sections or display sections of control panels or the like.

In recent years, in order to facilitate use by wheelchair users or in order to avoid reflection of ceiling light and the like, there have been proposed operations sections that have complex mechanisms, such as tilt mechanisms, to allow angle adjustment and changing of the position thereof, and operations sections that can be removed from the apparatus bodies and be used as remote controllers.

Patent Document 1 discloses an operations panel that includes at least one removable operations block replaceable by another operations block. According to Patent Document 1, if the position of the removable operations block is not convenient for a desired operation, the removable operations block can be replaced with another operations block, thereby eliminating the need for replacing the operations panel itself.

Patent Document 2 discloses an image forming apparatus that includes a remote operations section that is removably attached to the apparatus body and can be used as a remote

controller. Since this image forming apparatus

can be remotely controlled by the remote

operations section removed from the apparatus

body when needed, various types of users can

5   easily use the image forming apparatus.

        <Patent Document 1> Japanese Patent

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        <Patent Document 2> Japanese Patent

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10   However, in both cases, when the

operations section is removed from the apparatus

body and used as a remote controller, the image

forming apparatus can be operated by only the

user with the removed operations section but not

15   other users. Such a configuration is not

suitable for an apparatus used by many users.

Moreover, if the removable operations section

only has a part of the operational functions,

the functions that can be used from the removed

20   operations section are limited. This makes it

difficult to improve operability of the

operations panel. Providing the removable

operations section with all the operational

functions may be a solution. However, the

25   removable operations sections having all the

operational functions would be large in size.

DISCLOSURE OF THE INVENTION

          The present invention may solve at

5   least one problem described above.

          In view of the foregoing, the present

invention may improve operability of an

operations panel that is removably attachable to

an electronic apparatus and can be used in a

10   position removed from the electronic apparatus.

          According to an embodiment of the

present invention, there is provided an

operations panel that comprises plural

operations blocks that are attached to a main

15   body of an electronic apparatus and are used for

selecting selection items corresponding to

operational functions of the electronic

apparatus; a selection information output unit

that outputs a selection information item

20   indicating the selection item selected in the

operations block; a display operations block

that is removably attachable to the main body,

including a display unit that shows display

selection items used for selecting the

25   operational functions, a selection detecting

unit that detects the selected display selection

item shown by the display unit, and a display

control unit that causes the display unit to

show the selection items corresponding to the

5   operations blocks together with the display

selection item when the display operations block

is removed from the main body; and a selection

information retrieving unit that retrieves, as

the selection information item, a selection

10   result detected by the selection detecting unit

of the display operations block removed from the

main body; wherein the selection information

output unit outputs the selection information

item retrieved by the selection information

15   retrieving unit to the electronic apparatus.

          When the display operations block of

the above-described operations panel is used in

a position removed from the main body of the

electronic apparatus, the display operations

20   panel shows the selection items corresponding to

the operations blocks remaining on the main body

so as to allow users to select any of the

selection items. Then, a selection information

item indicating the selection result is

25   retrieved from the display operations block and

output to the electronic apparatus. That is,

when the display operations block is removed

from the main body of the electronic apparatus

and used as a remote controller, all the

5   functions of the operations blocks remaining on

the main body can be used from the display

operations block. Therefore, the operability of

the operations panel that can be used in a

position removed from the main body of the

10   electronic apparatus is improved. Moreover, the

above-described operations panel can realize

barrier-free use of the electronic apparatus

without limiting the functions of the electronic

apparatus. For example, wheelchair users can use

15   all the functions of the electronic apparatus in

a position convenient to them with use of the

display operations block removed from the main

body. The operations panel can also avoid

reflection of light more easily compared to the

20   related-art operations panels having

conventional installation angle adjusting

functions.

     The above-described operations panel is

preferably configured such that the display

25   control unit of the display operations block

causes the display unit to not show the

selection item corresponding to the operations

block in which occurrence of a failure is

detected by a failure detecting unit when the

5   display operations block is removed from the

main body.

        With this configuration, the need for

showing an abnormality indication on the display

operations block in response to an operation

10   request is eliminated. The processing performed

in the display operations block is thus

simplified, thereby improving operational

performance in the display operations block.

15   BRIEF DESCRIPTION OF THE DRAWINGS

        Fig. 1 is a block diagram illustrating

basic configurations of an operations panel and

an image forming apparatus according to an

embodiment of the present invention;

20   Fig. 2A is a perspective view

illustrating an example of an image forming

apparatus according to an embodiment of the

present invention;

        Fig. 2B illustrates an example of a

25   screen shown on a display operations section of

the image forming apparatus of Fig. 2A;

Fig. 3 is a schematic block diagram illustrating a configuration of an operations panel of the image forming apparatus of Fig. 2A;

5 Fig. 4A shows an example of an image forming apparatus with a display operations block removed from a main body of the image forming apparatus;

Fig. 4B illustrates an example of a

10 screen shown when a display operations block is removed;

Fig. 5A shows an example of an image forming apparatus with a second operations block removed from a main body of the image forming

15 apparatus;

Fig. 5B illustrates an example of a screen shown on a display operations block when a second operations block is removed;

Fig. 6 is a flowchart showing

20 processing performed by a control section of a base block of Fig. 3 according to an embodiment of the present invention;

Fig. 7 (continued from Fig. 6) is a flowchart showing processing performed by a

25 control section of a base block of Fig. 3

according to an embodiment of the present

invention;

Fig. 8 is a flowchart showing

processing performed by a first control section

5   of a first operations block of Fig. 3 according

to an embodiment of the present invention;

Fig. 9 is a flowchart showing

processing performed by a second control section

of a second operations block of Fig. 3 according

10   to an embodiment of the present invention;

Fig. 10A is a flowchart showing

processing performed by a third control section

of a display operations block of Fig. 3

according to an embodiment of the present

15   invention;

Fig. 10B is a flowchart showing an

example of processing performed by a display

control section of a display operations block;

Fig. 10C is a flowchart showing an

20   example of processing performed by an input

control section of a display operations block;

Fig. 11 is a flowchart showing

interruption processing that can be added to the

flowchart of Fig. 6 in the case where a second

25   operations block is removed;

Fig. 12 is a flowchart showing interruption processing that can be added to the flowchart of Fig. 6 in the case where a display operations block is removed;

5   Fig. 13 is a perspective view illustrating an operations panel having a failure alert function;

Fig. 14 is a flowchart showing an example of failure detection processing

10   performed in an operations panel;

Fig. 15 is a flowchart showing an example of processing performed in an operations panel when a first operations block is in an abnormal situation;

15   Fig. 16 is a flowchart showing an example of processing performed in an operations panel when a display operations block is in an abnormal situation;

Fig. 17 is a flowchart showing an

20   example of processing performed in an operations panel when a second operations block is in an abnormal situation; and

Fig. 18 is a table showing a relationship between failures in an operations

25   panel, operations, and reporting methods.

BEST MODE FOR CARRYING OUT THE INVENTION

The following provides examples of preferred embodiments wherein an operations

5   panel of the present invention is configured to be removably attachable to an image forming apparatus such as, e.g., a multifunction machines integrating a copying machine, a fax machine, and a printer. It should be understood

10   that the image forming apparatus is not limited to an electronic apparatus disclosed in the following embodiments, but may be any electronic apparatus having an operations panel a part of which is removable to be used as a remote

15   controller.

Fig. 2A is an external view illustrating an example of an image forming apparatus 1 according to an embodiment of the present invention. Fig. 2B shows an example of a

20   screen shown on a display operations block 34 of the image forming apparatus 1 of Fig. 2A. With reference to Fig. 2A, the image forming apparatus 1, which is well known in the art, comprises an image forming unit 110, an auto

25   document reader unit 120, and a sheet storage

unit 130. For example, the image forming
apparatus 1 transfers and fixes a toner image,
using electrographic technology, to a sheet
supplied from the sheet storage unit 130 based

5   on image information of an original document
read by the auto document reader unit 120, and
discharges the sheet with the toner image from a
discharge section (not shown).

An operations panel 3, with which users

10   operate the image forming apparatus 1, is
provided at the front side of the image forming
apparatus 1. The operations panel 3 comprises
first and second operations blocks 32 and 33
each having plural operations switches, and the

15   display operations block 34 that shows display
selection items used for selecting an
operational function of the image forming
apparatus 1.

Fig. 3 is a schematic block diagram

20   illustrating a configuration of the operations
panel 3 of the image forming apparatus 1 of Fig.
2A. With reference to Fig. 3, a main body 2 of
the image forming apparatus 1 comprises a main
body control section 21 for controlling

25   operational functions of the image forming

apparatus 1. The main body control section 21 is
connected to a memory section 23 for storing
various information items. The main body control
section 21 sends and receives serial signals and

5   the like for controlling the operations panel 3
via a main body interface 22. When a user
selects one of available operational functions
of the image forming apparatus 1 in the
operations panel 3, the main body control

10   section 21 controls operations according to a
selection information item indicating the
selected operational function, e.g., a copy
function.

The operations panel 3 further

15   comprises a base block 31 and a main body
interface 36, in addition to the first and
second operations blocks 32 and 33 and the
display operations block 34. While the
operations panel 3 includes two operations

20   blocks 32 and 33 in this embodiment, the
operations panel may include three or more
operations blocks. Further, the three or more
operations blocks may be arranged in various
different ways.

25   The base block 31 comprises a control

section 311, a memory section 312, a removal

detecting section 313, and a charger 314, etc.

The control section 311 is connected to the

memory section 312, the removal detecting

5   section 313, the charger 314, and the main body

interface 36.

The control section 311 comprises a

central processing unit (not shown), a large-

scale integrated circuit (LSI) (not shown), and

10   a digital signal processor (DSP) (not shown),

etc., which are well known in the art. The

control section 311 decodes the serial signals

input from the main body control section 21 so

as to control the operations blocks 32 - 34

15   according to the decoded result. The control

section 311 also reads input signals from the

operations blocks 32 - 34 and converts the input

signal into main body serial signals. The

control section 311 controls whether to allow or

20   suspend power supplied from the charger 314 to

the second operations block 33 and the display

operations block 34 depending on whether the

second operations block 33 and the display

operations block 34 are removed. The mounting or

25   removal of the second operations block 33 and

the display operations block 34 is detected by

the removal detecting section 313 (removal

detecting unit), which includes a contact switch

and a sensor (neither shown), etc.

5   The control section 311 is connected to

wired interfaces 316 corresponding to the first

operations block 32, the second operations block

33, and the display operations block 34, and to

wireless interfaces 317 corresponding to the

10   second operations block 33 and the display

operations block 34, via a bus 315. For example,

the first operations block 32 is provided with

only the wired interface 316 because the first

operations block 32 is fixed to the main body 2.

15   On the other hand, each of the second operations

block 33 and the display operations block 34 is

provided with the wired interfaces 316 and the

wireless interface 317 because the second

operations block 33 and the display operations

20   block 34 are removably attached to the main body

2.

          When the control section 311 inputs and

outputs various signals to and from the

operations blocks 32 - 34, the wired interfaces

25   316 are used if the removal detecting section

313 detects that the second operations block 33
and the display operations block 34 are attached
to the main body 2. On the other hand, the
wireless interfaces 317 are used if the removal
5   detecting section 313 detects that the second
operations block 33 and the display operations
block 34 are removed from the main body 2.

The charger 314 comprises a first
charger section 314a for supplying power to the
10   second operations block 33, and a second charger
section 314b for supplying power to the display
operations block 34. The control section 311
causes the first charger section 314a to supply
power to the second operations block 33 when the
15   removal detecting section 313 detects that the
second operations block 33 is attached to the
main body 2, and causes the second charger
section 314b to supply power to the display
operations block 34 when the removal detecting
20   section 313 detects that the display operations
block 34 is attached to the main body 2.

The first operations block 32, which is
fixed to the main body 2, comprises a first
control section 321 including a CPU (not shown),
25   etc., and operates according to various programs

stored in an internal storage medium (not shown)
and the like. The first control section 321
writes data into and reads data from a memory
section 322. The first control section 321 also

5   decodes signals input from the base block 31 via
a wired interface 323 and controls an LED matrix
circuit 324 so as to control turning on/off of
LEDs 325 corresponding to a copy application and
a reservation application, etc., in the image

10 forming apparatus 1.·

        Moreover, the first control section 321
decodes inputs from a key matrix circuit 326 so
as to identify operations with operation keys
327 in response to a key information request,

15 etc., from the base block 31, and outputs the
decoded result as a selection information item
to the control section 311 of the base block 31.

        The second operations block 33,
similarly to the first operations block 32,

20 comprises a second control section 331 including
a CPU (not shown), etc. The second control
section 331 writes data into and reads data from
a memory section 332. The second control section
331 also decodes signals input from the base

25 block 31 via a wired interface 333 or a wireless

interface 334 and controls an LED matrix circuit
335 so as to control turning on/off of a start
LED 336 corresponding to a start key, etc.

Moreover, the second control section
5   331 decodes inputs from a key matrix circuit 337
so as to identify operations with operation keys
338 including numeric keys and an interruption
key, etc., in response to a key information
request, etc., from the base block 31, and
10   outputs the decoded result as a selection
information item to the control section 311 of
the base block 31.

The second control section 331
determines whether to use a battery 339 to
15   supply operating power to the second operations
block 33 based on battery level or the like of
the wired interface 333 so as to control
switching of the battery 339, and switches
between the wired interface 333 and the wireless
20   interface 334. These switching operations may be
automatically performed with the use of a
circuit.

The display operations block 34, which
is removably attached to the main body 2,
25   comprises a third control section 341 including

a CPU, etc., and operates according to various
programs stored in an internal storage medium
(not shown) and the like. The third control
section 341 writes data into and reads data from

5   a memory section 342. The third control section
341 also decodes signals input from the base
block 31 via a wired interface 343 or a wireless
interface 344 and controls a display control
section 345 so as to selectively show various

10   information items held in the memory section 342
and various information items sent from the base
block 31 on an LCD 346 (display unit).

The third control section 341 transmits
a touch panel positional information item

15   (described below) of a touch panel 348
(selection detecting unit) from an input control
section 347 to the control section 311 as a
selection information item in response to a
positional information request of the touch

20   panel 348 from the control section 311. In this
embodiment, the LCD 346 and the touch panel 348
are arranged in a superposed relationship. The
LCD 346 shows text/images under the control of
the display control section 345 according to

25   instructions from the third control section 341.

A position pressed on the touch panel 348 is
detected as a coordinate position on a display
screen by the input control section 347 such
that the touch panel positional information item
5   indicating the detected coordinate position is
output from the input control section 347 to the
third control section 341.

The third control section 341,
similarly to the second control section 331 of
10   the second operations block 33, determines
whether to use a battery 349 to supply operating
power to the display operations block 34 based
on battery level or the like of the wired
interface 343 so as to control switching of the
15   battery 349, and switches between the wired
interface 343 and the wireless interface 344.
These switching operations may be automatically
performed with use of a circuit.

The following describes examples of the
20   display selection items shown on the LCD 346
with reference to Figs. 2B, 4A, 4B, 5A, and 5B.
Fig. 4A shows an example of the image forming
apparatus 1 with the display operations block 34
removed from the main body 2 of the image
25   forming apparatus 1. Fig. 4B illustrates an

example of a screen shown when the display
operations block 34 is removed. Fig. 5A shows an
example of the image forming apparatus 1 with
the second operations block 33 removed from the
5   main body 2 of the image forming apparatus 1.
Fig. 5B illustrates an example of a screen shown
on the display operations block 34 when the
second operations block 33 is removed.

    When the second operations block 33 and
10   the display operations block 34 are attached to
the main body 2, a first display screen IMG1 of
Fig. 2B for copying operations in the image
forming apparatus 1 appears, which includes a
first display section P1 having a first area
15   346a for selecting the type of original
documents, the image density, and options for
feeding original documents, a second area 346b
showing status and messages, a third area 346c
showing the number of original documents read
20   into a memory, the number of sheets or copies to
be printed, and the number of sheets already
printed, and a fourth area 346d showing function
items of the image forming apparatus 1, etc.

    When the display operations block 34 is
25   removed from the main body 2 as shown in Fig. 4A,

a second display screen IMG2 of Fig. 4B appears,

which includes the first display section P1, a

second display section P2 showing selection

items corresponding to the first operations

5   block 32, and a third display section P3 showing

selection items corresponding to the second

operations block 33.

Although the second display screen IMG2

includes the first display section P1 reduced in

10   its width direction and the second display

section P2 and the third display section P3 one

on each side of the first display section P1 in

this embodiment, the layout in the second

display screen IMG2 may be changed. For example,

15   the items shown in the first display section P1

may be replaced by the selection items shown in

the second display section P2 or by the

selection items shown in the third display

section P3.

20   When the second operations block 33 is

removed from the main body 2 as shown in Fig. 5A,

a third display screen IMG3 of Fig. 5B appears,

which includes the first display section P1 and

the third display section P3 showing the

25   selection items corresponding to the second

operations block 33. In the third display screen
IMG3, the third display section P3 is shown at
the right side of the first display section P1
according to the positional relationship of the

5   second operations block 33 with respect to the
display operations block 34, thereby preventing
users of the image forming apparatus 1 from
feeling that something strange is happening.

         The following describes an example of

10   processing performed by the control section 311
of the base block 31 with reference to Figs. 6
and 7. Fig. 6 is a flowchart showing a part of
the processing performed by the control section
311 of the base block 31 of Fig. 3. Fig. 7 is a

15   flowchart showing the rest of the processing
performed by the control section 311 of the base
block 31 of Fig. 3.

         In step S1, the control section 311
determines whether the display operations block

20   34 is removed from the main body 2 based on
detection by the removal detecting section 313.
If the control section 311 determines that the
display operations block 34 is not removed (No
in step S1), the power sources are switched such

25   that the second charger section 314b of the

charger 314 supplies power to the display

operations block 34 in step S2. Then, the

interface to be used for input to and output

from the display operations block 34 is set to

5   the corresponding wired interface 316 in step S3,

and the processing proceeds to step S4.

     In step S4, the control section 311

determines whether the second operations block

33 is removed from the main body 2 based on

10   detection by the removal detecting section 313.

If the control section 311 determines that the

second operations block 33 is not removed (No in

step S4), the processing proceeds to step S5.

     In step S5, the power sources are

15   switched such that the first charger section

314a of the charger 314 supplies power to the

second operations block 33. Then in step S6, the

interface to be used for input to and output

from the second operations block 33 is set to

20   the corresponding wired interface 316. Then in

step S7, an LCD screen switching request for

showing the first display screen IMG1 of Fig. 2B

is transmitted to the third control section 341

such that the LCD 346 shows the first display

25   screen IMG1, and the processing proceeds to step

S16 of Fig. 7.

On the other hand, if the control
section 311 determines that the second
operations block 33 is removed (Yes in step S4),
5   the power sources are switched by suspending the
power supply to the second operations block 33
from the first charger section 314a of the
charger 314 in step S8. Then, the interface to
be used for input to and output from the second
10   operations block 33 is set to the corresponding
wireless interface 317 in step S9. Then in step
S10, an LCD screen switching request for showing
the third display screen IMG3 of Fig. 5B is
transmitted to the third control section 341
15   such that the LCD 346 shows the third display
screen IMG3, and the processing proceeds to step
S16 of Fig. 7.

If the control section 311 determines
that the display operations block 34 is removed
20   (Yes in step S1), the power sources are switched
by suspending the power supply to the display
operations block 34 from the second charger
section 314b of the charger 314 in step S11.
Then, the interface to be used for input to and
25   output from the display operations block 34 is

set to the corresponding wireless interface 317
in step S12, and the processing proceeds to Step
S13.

In step S13, the power sources are

5   switched such that the first charger section
314a of the charger 314 supplies power to the
second operations block 33. Then in step S14,
the interface to be used for input to and output
from the second operations block 33 is set to

10   the corresponding wired interface 316. Then in
step S15, an LCD screen switching request for
showing the second display screen IMG2 of Fig.
4B is transmitted to the third control section
341 such that the LCD 346 shows the second

15   display screen IMG2, and the processing proceeds
to step S16 of Fig. 7.

In step S16 of Fig. 7, the control
section 311 determines whether a key/touch panel
information request is received from the main

20   body 2 via the main body interface 36. If the
control section 311 determines that the
key/touch panel information request is not
received (No in step S16), the processing
proceeds to step S17.

25   In step S17, the control section 311

determines whether an ON/OFF request for turning
on/off the LEDs 325 is received from the main
body 2 via the main body interface 36. If the
control section 311 determines that the ON/OFF

5   request is not received (No in step S17), the
processing proceeds to step S18.

In step S18, the control section 311
determines whether a display request for causing
the LCD 346 to show a display screen is received

10   from the main body 2 via the main body interface
36. If the control section 311 determines that
the display request is not received (No in step
S18), the processing returns to step S1 of Fig.
6 to repeat a series of the operations. If, on

15   the other hand, the control section 311
determines that the display request is received
(Yes in step S18), an LCD screen switching
request for showing the display screen
corresponding to the display request is

20   transmitted to the third control section 341 of
the display operations block 34 such that the
LCD 346 shows the display screen corresponding
to the display request in step S19. Then, the
processing returns to step S1 of Fig. 6 to

25   repeat a series of the operations.

If the control section 311 determines
that the ON/OFF request for turning on/off the
LEDs 325 is received (Yes in step S17), On/OFF
requests for turning on/off the LEDs 325 and the
5 start LED 336 are transmitted to the first
control section 321 and the second control
section 331, respectively, such that the first
and second control sections 321 and 331 perform
ON/OFF control according to the respective
10 requests in step S20. Then in step S21, an LCD
screen switching request for showing the display
screen corresponding to the display request is
transmitted to the third control section 341 of
the display operations block 34 such that the
15 LCD 346 shows the display screen corresponding
to the display request. Then, the processing
returns to step S1 of Fig. 6 to repeat a series
of the operations.

          If in step S16 the control section 311
20 determines that the key/touch panel information
request is received (Yes in step S16), the
control section 311 acquires key information
items from the first control section 321 and the
second control section 331 and saves the
25 acquired key information items in the memory

section 312. The key information items held in

the memory section 312 are decoded and converted

into main body interface signals so as to be

transmitted to the main body 2 in step S23, and

5 the processing proceeds to step S24.

In step S24, the control section

(selection information retrieving unit) 311

acquires a touch panel positional information

item (corresponding to selection information

10 item in the appended claims) indicating a

selected position on the touch panel 348 from

the third control section 341 and saves the

acquired touch panel positional information item

in the memory section 312. The touch panel

15 positional information item held in the memory

section 312 is decoded and converted into main

body interface signals so as to be transmitted

to the main body 2 in step S25, and the

processing proceeds to step S26.

20 In step S26, the control section 311

(selection information output unit) outputs the

main body interface signals as the decoded

results of the key information items and the

touch panel positional information item

25 (selection information item) via the main body

interface 36 to the main body 2 in step S26, and the processing returns to step S1 to repeat a series of the operations.

In the above embodiment, the control
5   section 311 of the base block 31 functions as a selection information detecting unit and a selection information output unit in the appended claims.

In the above embodiment, the base block
10   31 specifies the display screen to be shown for the display operations block 34 according to whether the second operations block 33 and the display operations block 34 are attached to the main body 2. However, the present invention is
15   not limited to this embodiment. For example, the display operations block 34 may determine the display screen to be shown by acquiring information about whether the second operations block 33 and the display operations block 34 are
20   attached to the main body 2.

The following describes an example of processing performed by the first control section 321 of the first operations block 32 with reference to Fig. 8. Fig. 8 is a flowchart
25   showing the processing performed by the first

control section 321 of the first operations

block 32 of Fig. 3 according to an embodiment of

the present invention.

In step S111, the first control section

5   321 determines whether an SW information request

for output of a matrix key information item to

be used for detecting the operation keys 327 is

received from the control section 311 of the

base block 31. If the first control section 321

10   determines that the SW information request is

not received (No in step S111), the processing

proceeds to step S113. If, on the other hand,

the control section 311 determines that the SW

information request is received (Yes in step

15   S111), all the matrix key information items held

in the LED matrix circuit 324 are sequentially

transmitted to the control section 311 of the

base block 31 in step S112. Then, the processing

proceeds to step S113.

20   In step S113, the first control section

321 determines whether an ON/OFF request for

turning on/off the LEDs 325 is received from the

control section 311 of the base block 31. If the

first control section 321 determines that the

25   ON/OFF request is not received (No in step S113),

the processing proceeds to step S115. If, on the
other hand, the first control section 321
determines that the ON/OFF request is received
(Yes in step S113), an LED information item
5   indicating the ON/OFF status of the LEDs 325
corresponding to the ON/OFF request is saved in
the memory section 322 in step S114. Then, the
processing proceeds to step S115.

In step S115, ON/OFF control is
10   performed on the LED matrix circuit 324
according to the LED information item held in
the memory section 322 so as to turn on/off the
LEDs 325. Then the processing returns to step
S111 to repeat a series of the operations.

15   The following describes an example of
processing performed by the second control
section 331 of the second operations block 33
with reference to Fig. 9. Fig. 9 is a flowchart
showing the processing performed by the second
20   control section 331 of the second operations
block 33 of Fig. 3 according to an embodiment of
the present invention.

In step S211, the second control
section 331 determines whether the second
25   operations block 33 is removed from the base

block 31 (main body 2) based on the status of an

internal contact switch and a result of

communication with the base block 31, etc. If

the second control section 331 determines that

5   the second operations block 33 is not removed

(No in step S211), power sources are switched

such that power is supplied from the base block

31 in step S212. Then, the interface to be used

is set to the wired interface 333 in step S213,

10   and the processing proceeds to step S216.

        If, on the other hand, the second

control section 331 determines that the second

operations block 33 is removed (Yes in step

S211), the power sources are switched such that

15   power is supplied from the battery 339 in step

S214. Then, the interface to be used is set to

the wireless interface 334 in step S215, and the

processing proceeds to step S216.

        In step S216, the second control

20   section 331 determines whether an SW information

request is received from the control section 311

of the base block 31. If the second control

section 331 determines that the SW information

request is not received (No in step S216), the

25   processing proceeds to step S218. If, on the

other hand, the second control section 331
determines that the SW information request is
received (Yes in step S216), all the matrix key
information items held in the LED matrix circuit

5   335 are sequentially transmitted to the control
section 311 of the base block 31 in step S217.
Then, the processing proceeds to step S218.

In step S218, the second control
section 331 determines whether an ON/OFF request

10 for turning on/off the start LED 336 is received
from the control section 311 of the base block
31. If the control section 311 determines that
the ON/OFF request is not received (No in step
S218), the processing proceeds to step S220. If,

15 on the other hand, the second control section
331 determines that the ON/OFF request is
received (Yes in step S218), an LED information
item indicating the ON/OFF status of the start
LED 336 corresponding to the ON/OFF request is

20 saved to the memory section 332 in step S219.
Then, the processing proceeds to step S220.

In step S220, ON/OFF control is
performed on the LED matrix circuit 335
according to the LED information item held in

25 the memory section 332 so as to turn on/off the

start LED 336. Then the processing returns to step S211 to repeat a series of the operations.

The following describes an example of processing performed by the third control section 341 of the display operations block 34 with reference to Fig. 10A. Fig. 10A is a flowchart showing the processing performed by the third control section 341 of the display operations block 34 of Fig. 3 according to an embodiment of the present invention. Fig. 10B is a flowchart showing an example of processing performed by the display control section 345 of the display operations block 34. Fig. 10C is a flowchart showing an example of processing performed by the input control section 347 of the display operations block 34.

In step S311 of Fig. 10A, the third control section 341 determines whether the display operations block 34 is removed from the base block 31 (main body 2) based on the status of an internal contact switch and a result of communication with the base block 31, etc. If the third control section 341 determines that the display operations block 34 is not removed (No in step S311), the power sources are

switched such that power is supplied from the
base block 31. Then, the interface to be used is
set to the wired interface 343 in step S313, and
the processing proceeds to step S316.

5   If, on the other hand, the third
control section 341 determines that the display
operations block 34 is removed (Yes in step
S311), the power sources are switched such that
power is supplied from the battery 349. Then,

10 the interface to be used is set to the wireless
interface 344 in step S315, and the processing
proceeds to step S316.

       In step S316, the third control section
341 determines whether an LCD screen switching

15 request is received from the control section 311
of the base block 31. If the third control
section 341 determines that the LCD screen
switching request is not received (No in step
S316), the processing proceeds to step S318. If,

20 on the other hand, the third control section 341
determines that the LCD screen switching request
is received (Yes in step S316), the third
control section 341 retrieves a display data
item (corresponding to a selection item)

25 corresponding to the LCD screen switching

request, and instructs the display control

section 345 to show a screen with the display

data item in step S317. Then, the processing

proceeds to step S318.

5   In step S318, the third control section

341 determines whether a touch panel positional

information request is received from the control

section 311 of the base block 31. If the third

control section 341 determines that the touch

10   panel positional information request is not

received (No in step S318), the processing

returns to step S311 to repeat a series of the

operations. If, on the other hand, the third

control section 341 determines that the touch

15   panel positional information request is received

(Yes in step S318), the third control section

341 reads a touch panel positional information

item corresponding to a position on the touch

panel 348 selected by a user and transmits the

20   read touch panel positional information item to

the control section 311 in step S319. Then, the

processing proceeds to step S320.

          In step S320, the third control section

341 specifies the display data item for the

25   display control section 345, if necessary, such

that the screen shown on the LCD 346 is updated.
Then, the processing proceeds to step S311 to
repeat a series of the operations.

In the above embodiment, the third
5   control section 341 of the display operations
block 34 functions as a display control unit and
a selection item retrieving unit in the appended
claims. The display data item corresponding to
the selection item may be retrieved in various
10   different ways. For example, the display data
item may be stored in a predetermined storage
medium in advance so as to be retrieved in
response to an instruction from the control
section 311.

15   The following describes an example of
the processing performed by the display control
section 345 of the display operations block 34
with reference to Fig. 10B.

In step S331, the display control
20   section 345 determines whether an instruction to
show a screen is received from the third control
section 341. If the display control section 345
determines that the instruction to show a screen
is not received (No in step S331), the display
25   control section 345 waits for the instruction

while repeating this determination step S331. If,
on the other hand, the display control section
345 determines that the instruction to show a
screen is received (Yes in step S331), the

5   display control section 345 reads a display data
item (corresponding to a selection item)
corresponding to a display screen specified by
the third control section 341 from the memory
section 342 in step S332 such that the LCD 346

10   shows the display screen with the read display
data item in step S333. Then the processing
returns to step S331 to repeat a series of the
operations.

The following describes an example of

15   the processing performed by the input control
section 347 of the display operations block 34
with reference to Fig. 10C.

In step S341, the input control section
347 determines whether there is input from the

20   touch panel 348. If the input control section
347 determines that there is no input (No in
step S341), the input control section 347 waits
for input from the touch panel 348 while
repeating the determination step S341. If, on

25   the other hand, the input control section 347

determines that there is input from the touch

panel 348 (Yes in step S341), the input control

section 347 generates a touch panel positional

information item indicating a selected position

5   on the touch panel 348 and transmits the touch

panel positional information item to the third

control section 341 in step S342. Then, the

processing returns to the step S341 to repeat a

series of the operations.

10   In this embodiment, the base block 31

specifies display data items for the display

operations block 34 according to whether the

second operations block 33 and the display

operations block 34 are removed from the main

15   body 2. However, the present invention is not

limited to this embodiment. For example, display

data items to be shown when the second

operations block 33 and the display operations

block 34 are removed may be stored in advance in,

20   e.g., the memory section 342 such that one or

more of the display data items are extracted

from the memory section 342 according to whether

the second operations block 33 and the display

operations block 34 are removed.

25   The following describes an example of

the operations performed in the operations panel
3 on the image forming apparatus 1 having the
above-described configuration according to the
present invention.

5   When the display operations block 34 is
removed from the main body 2 of the image
forming apparatus 1 and receives an LCD screen
switching request from the base block 31, the
display operations block 34 shows the second
10   display screen IMG2 by causing the LCD (display
unit) 346 to show the display data items
(selection items) corresponding to the first
operations block 32 and the second operations
block 33 together with the display selection
15   items under the control of the third control
section 341 (display control unit). The user
selects any of the selection items or the
display selection items shown on the LCD 346,
and the selected item is detected by the touch
20   panel 348 (selection detecting unit). Then, the
control section (selection information
retrieving unit) 311 retrieves the selection
result as a touch panel positional information
item (selection information item). The control
25   section (selection information output unit) 311

outputs the touch panel positional information
item to the image forming apparatus (electronic
apparatus) 1 on which the operations panel 3 is
installed.

5   Accordingly, when the display
operations block 34 is removed from the main
body 2 of the image forming apparatus 1 and used
as a remote controller, all the functions of the
first and second operations blocks 32 and 33
10 remaining on the main body 2 can be used from
the display operations block 34. Therefore, the
operability of the operations panel 3 that can
be used in a position removed from the main body
2 of the image forming apparatus 1 is improved.
15 The operations panel 3 can realize barrier-free
use of the image forming apparatus 1 without
limiting the functions of the image forming
apparatus 1. For example, wheelchair users can
use all the functions of the image forming
20 apparatus 1 in a position convenient to them
with use of the display operations block 34
removed from the main body 2. The operations
panel 3 can also avoid reflection of light more
easily compared to the related-art operations
25 panels having conventional installation angle

adjusting functions.

As described above, when the second
operations block 33, which is removably attached
to the main body 2, is removed from the main

5   body 2, the display operations block 34
remaining on the main body 2 shows the selection
items corresponding to the second operations
block 33 so as to allow users to select any of
the selection items. This configuration prevents

10   the operability at the main body 2 from being
lowered due to the removal of the second
operations block 33.

The display operations block 34
retrieves the selection items corresponding to

15   the first and second operations blocks 32 and 33
from the first and second operations blocks 32
and 33 remaining on the main body 2 when the
display operations block 34 is removed from the
main body 2. Therefore, the display operations

20   block 34 can respond to the change of the
operations blocks with ease, which contributes
to widening applicability of the operations
panel 3.

The following describes interruption

25   control performed in the image forming apparatus

1 comprising the above-described operations

panel 3. The configuration of the image forming

apparatus 1 is the same as the one described

above, and is not described herein.

5   In the image forming apparatus, the

main body 2 and the operations panel 3 are

controlled by the main body control section 21

and the control section 311, respectively. The

main body control section 21 is adapted to send

10   input requests to the control section 311,

analyze validity of input signal, and perform

sequence control on the main body 2, for example.

The control section 311 of the operations panel

3 is adapted to perform display control on the

15   operations panel 3, acquire input signals from

the operations blocks 32 - 34, and communicate

with the main body 2. For instance, the control

section 311 can decode input signals sent from

the main body control section 21 so as to cause

20   the display operations block 34 to show the

decoded result, and can read input signal sent

from the operations blocks 32 - 34 so as to send

the read result to the main body 2.

Predetermined codes are assigned to control

25   signals and are shared by the control sections

of the main body 2 and the operations panel 3

for the purpose of maintaining operational

consistency.

In related-art interruption control,

5   when an interruption request is received, a main

body control section determines whether an

interruption is acceptable. If the interruption

is acceptable, interruption processing is

performed. If, on the other hand, the

10 interruption is not acceptable, the interruption

is rejected. In the interruption processing,

conditions that have been set before the

interruption are held in a storage device that

is accessible by the main control section, and

15 then an input request for an interruption

operation is output. When the interruption

operation is completed, an input restart request

is output based on information about the

suspended operation held in the storage device

20 so as to restart the suspended operation.

The problem with this related-art

interruption control is that the ongoing

operation is suspended by the interruption.

Especially, in the case of an image forming

25 apparatus with an operations panel 3 having an

operations block removably attachable to a main

body 2 just like the above-described image

forming apparatus 1, when an interruption key is

pressed on the operations block removed from the

5   main body 2, a user using the operations panel 3

installed on the main body 2 suddenly becomes

unable to continue operations. Therefore, the

user might think that the image forming

apparatus has broken down.

10   The following is an example of

processing performed by the control section 311

of the base block 31 of the operations panel 3

of an embodiment of the present invention,

wherein an ongoing operation can be continued

15   without being suspended by the interruption. It

is to be noted that as the basic processing is

the same as the processing shown in Figs. 6 and

7, the following describes the different points

only.

20   The following describes interruption

processing performed when the second operations

block 33 is removed with reference to Fig. 11.

Fig. 11 is a flowchart showing interruption

processing that can be added to the flowchart of

25   Fig. 6 in the case where the second operations

block 33 is removed.

The steps shown in the flowchart of Fig.
11 are to be added to the block "A" in the
flowchart of Fig. 6. In other words, the steps
5   shown in the flowchart of Fig. 11 are performed
after step S10 in which the third display screen
IMG3 is shown. In step S41, the control section
311 determines whether the display operations
block 34 is transmitting information items (i.e.
10   is being operated). If the control section 311
determines that the display operations block 34
is not transmitting information items (No in
step S41), the processing proceeds to step S16
of Fig. 7 to repeat a series of the operations.
15   If, on the other hand, the control section 311
determines that the display operations block 34
is transmitting information items (Yes in step
S41), the processing proceeds to step S42.

In step S42, the control section 311
20   determines whether the interruption key of the
second operations block 33 is pressed. If the
control section 311 determines that the
interruption key is not pressed (No in step S42),
the processing proceeds to step S16 of Fig. 7 to
25   repeat a series of the operations. If, on the

other hand, the control section 311 determines

that the interruption key is pressed (Yes in

step S42), the processing proceeds to step S43.

In step S43, the control section 311

5   reports to the main body control section 21 that

the interruption key (hardware) is pressed,

information items (program, history, touch panel

positional information items, etc.) that have

already been completely transmitted are saved to

10   the memory section 23 of the main body 2. In

step S44, information items that have

transmitted from the display operations block 34

but not transmitted to the main body control

section 21 are saved in the memory section 312

15   of the base block 31. Then, the processing

proceeds to step S45.

In step S45, the control section 311

determines whether a key information request for

a key information item from the second

20   operations block 33 is received from the main

body 2. If the control section 311 determines

that the key information request is not received

(No in step S45), the control section 311

determines whether an LED ON/OFF request is

25   received from the main body 2 in step S46. If

49

the control section 311 determines that the

ON/OFF request is not received (No in step S46),

the processing proceeds to step S50.

If, on the other hand, the control

5   section 311 determines that the ON/OFF request

is received (Yes in step S46), ON/OFF requests

are transmitted to the corresponding first and

second operations blocks 32 and 33 such that the

first and second control sections 321 and 331

10   perform ON/OFF control according to the

respective requests in step S47. Then, the

processing proceeds to step S50.

If, in step S45, the control section

311 determines that the key information request

15   for a key information item from the second

operations block 33 is received (Yes in step

S45), the control section 311 acquires the key

information item from the second operations

block 33 and saves the acquired key information

20   item in the memory section 312 in step S48. Then

in step S49, the key information item held in

the memory section 312 is decoded, and the

decoded result is transmitted to the main body

control section 21. Then, the processing

25   proceeds to step S50.

In step S50, the control section 311
determines whether the interruption operation is
completed and whether the image forming
apparatus 1 is ready for the next operation. If
5   the control section 311 determines that the
image forming apparatus 1 is not ready for the
next operation (No in step S50), the processing
returns to step S45 to repeat a series of the
operations. If, on the other hand, the control
10 section 311 determines that the image forming
apparatus 1 is ready for the next operation (Yes
in step S50), the processing proceeds to step
S51.

     The control section 311 receives an
15 interruption operation completion signal from
the main body control section 21 in step S51,
and confirms that the information items (program,
history, touch panel positional information
items, etc.) held in the memory section 23 have
20 been executed by the main body control section
21 in step S52. In step S53, the information
items held in the memory section 312 of the base
block 31 are transmitted to the main body
control section 21. Then, the processing returns
25 to step S1 of Fig. 6 to repeat a series of the

operations.

The following describes interruption
processing performed when the display operations
block 34 is removed with reference to Fig. 12.

5   Fig. 12 is a flowchart showing interruption
processing that can be added to the flowchart of
Fig. 6 in the case where the display operations
block 34 is removed.

The steps shown in the flowchart of Fig.

10   12 are to be added to the block "B" in the
flowchart of Fig. 6. In other words, the steps
shown in the flowchart of Fig. 12 are performed
after step S15 in which the second display
screen IMG2 is shown. In step S61, the control

15   section 311 determines whether the second
operations block 33 is transmitting information
items (i.e. is being operated). If the control
section 311 determines that the second
operations block 33 is not transmitting

20   information items (No in step S61), the
processing proceeds to step S16 of Fig. 7 to
repeat a series of the operations. If, on the
other hand, the control section 311 determines
that the second operations block 33 is

25   transmitting information items (Yes in step S61),

the processing proceeds to step S62.

In step S62, the control section 311 determines whether the interruption key of the display operations block 34 is pressed. If the control section 311 determines that the interruption key is not pressed (i.e. not selected) (No in step S62), the processing proceeds to step S16 of Fig. 7 to repeat a series of the operations. If, on the other hand, the control section 311 determines that the interruption key is pressed (Yes in step S62), the processing proceeds to step S63.

In step S63, the control section 311 reports to the main body control section 21 that the interruption key (software) is pressed (selected), information items (program, history, touch panel positional information items, etc.) that have already been completely transmitted are saved in the memory section 23 of the main body 2. In step S64, information items that have been transmitted from the second operations block 33 but not transmitted to the main body control section 21 are saved in the memory section 312 of the base block 31. Then, the processing proceeds to step S65.

In step S65, the control section 311 determines whether a key information request for a key information item from the display operations block 34 is received from the main body 2. If the control section 311 determines that the key information request is not received (No in step S65), the control section 311 determines whether an LCD display request is received from the main body 2 in step S66. If the control section 311 determines that the LCD display request is not received (No in step S66), the processing proceeds to step S70.

If, on the other hand, the control section 311 determines that the LCD display request is received (Yes in step S66), the control section 311 instructs the display operations block 34 to show the display screen corresponding to the LCD display request on the LCD 346 in step S67. Then, the processing proceeds to step S70.

If, in step S65, the control section 311 determines that the key information request for a key information item from the display operations block 34 is received (Yes in step S65), the control section 311 acquires the key

information item from the display operations

block 34 and saves the acquired key information

item in the memory section 312 in step S68. Then

in step S69, the key information item held in

5   the memory section 312 is decoded, and the

decoded result is transmitted to the main body

control section 21. Then, the processing

proceeds to step S70.

        In step S70, the control section 311

10   determines whether the interruption operation is

completed and whether the image forming

apparatus 1 is ready for the next operation. If

the control section 311 determines that the

image forming apparatus 1 is not ready for the

15   next operation (No in step S70), the processing

returns to step S65 to repeat a series of the

operations. If, on the other hand, the control

section 311 determines that the image forming

apparatus 1 is ready for the next operation (Yes

20   in step S70), the processing proceeds to step

S71.

        The control section 311 receives an

interruption operation completion signal from

the main body control section 21 in step S71,

25   and confirms that the information items (program,

history, touch panel positional information
items, etc.) held in the memory section 23 have
been executed by the main body control section
21 in step S72. In step S73, the information

5   items held in the memory section 312 of the base
block 31 are transmitted to the main body
control section 21. Then, the processing returns
to step S1 of Fig. 6 to repeat a series of the
operations.

10   In the above embodiment, the control
section 311 of the base block 31 also functions
as an interruption detecting unit and an
interruption completion detecting unit in the
appended claims. Further, the memory section 312

15   of the base block 31 functions as a selection
information memory unit in the appended claims.

          The following is an example of the
interruption processing performed in the image
forming apparatus 1 according to an embodiment

20   of the present invention.

          A first person is performing
complicated operations using the operations
panel 3 of the image forming apparatus 1.

          The display operations block 34 shows

25   touch panel, including, e.g., soft keys for

various functions of the image forming apparatus

1, and feedback information items from the main

body control section 21. The first person

performs the operations using the first

5   operations block 32 and the display operations

block 34 having soft and hard keys while

monitoring the feedback information items.

In this situation, a second person

removes the second operations block 33, which

10   includes the numeric keys, in order to just make

a photocopy using the second operations block 33

as a remote controller. When the control section

311 of the base block 31 detects that the second

operations block 33 is removed, the display

15   operations block 34 zooms out the soft keys and

feedback information that have been shown so as

to show another sets of soft keys that replace

the keys of the removed second operations block

33 and other feedback information items on the

20   same screen. The first person can therefore

continue the operations. Then, the second person,

who has removed the second operations block 33,

presses the interruption key of the second

operations block 33 in order to make a photocopy.

25   Upon detecting that that the

interruption key is pressed, the control section
311 of the base block 31 sends an interruption
request signal to the main body control section
21. Upon receiving the interruption request

5   signal, the main body control section 21
temporarily stores various conditions that have
been input and set up to that point in the
memory section 23 so as to be in a standby mode,
and outputs a request for the next input

10   (interruption input) to the control section 311
of the base block 31.

        In response to the interruption input
request from the main body control section 21,
the control section 311 of the base block 31

15   saves information items input from the first
operations block 32 and the display operations
block 34 in the memory section (selection
information memory unit) 312 as records while
waiting for an input from the second operations

20   block 33. When the control section 311 receives
an input from the second operations block 33,
the control section 311 sends the input to the
main body control section 21 (in a predetermined
encoded form).

25   For example, if the second person only

needs to make a photocopy, the second person

places an original document on a document table,

selects the number of copies using the numeric

keys of the second operations block 33, and

5   presses the start key. The control section 311

of the base block 31 transmits information

indicating the number of copies and a copy start

command to the main body control section 21 in

the encoded form.

10   Upon receiving the encoded information,

the main body control section 21 executes

sequence control for making a photocopy. After

completion of the copy operation, the main body

control section 21 sets the conditions of the

15   main body 2 back to the conditions before the

interruption, and outputs a request for the next

input. In response to the input request, the

control section 311 of the base block 31

determines that the interruption operation is

20   completed, returns to the state before the

interruption, transmits operations information

that has been saved in the memory section 312

after the interruption, and restarts the last

interrupted operation.

25   In this way, with the operations panel

3 having the above-described configuration, when

an interruption request is issued from the

second operations block 33 or the display

operations block 34, selection information items

5 input during the interrupting operation are

saved in order of time. When the interruption

operation is completed, the selection

information items saved during the interruption

operation are output. Accordingly, for example,

10 an interruption operation of, e.g., making one

copy, can be easily cut into an ongoing

operation. Moreover, a user who has been

performing an operation can continue input while

the interruption operation is performed. That is,

15 if the interruption key is pressed, inputs for

the interrupted operation can be performed,

without being suspended, in parallel with the

interruption operation. Thus, operating

efficiency of the operations panel 3 is improved.

20 The following describes an operations

panel 3 to which a failure alert function is

added according to an embodiment of the present

invention. The configuration of the operations

panel 3 in this embodiment is the same as the

25 one in the above embodiments except the

differences described below. Fig. 13 is a
perspective view illustrating the operations
panel 3 having the failure alert function.

The operations panel 3 comprises the

5   base block 31, the first operations block 32,
the second operations block 33, and the display
operations block 34, which are described in the
above embodiments. A failure display section 35
that provides a failure alert function for

10   showing failures of the operations blocks 32 -
34 is added to the base block 31.

The failure display section 35
comprises a first status display section 35a, a
second status display section 35b, and a third

15   status display section 35c corresponding to the
first operations block 32, the second operations
block 33, and the display operations block 34,
respectively. The first - third status display
sections 35a - 35c include displays, such as

20   LEDs, that are turned on/off by the control
section 311.

Although the failure display section 35
is added to the base block 31 in this embodiment,
the failure display section 35 may be added in

25   various different forms. For example, the

failure display section 35 may be added as a new
block, or may be added to the display operations
block 34.

The following describes an example of
5   failure detection processing performed by the
control section 311 of the base block 31 of the
operations panel 3 with reference to Fig. 14.
Fig. 14 is a flowchart showing an example of the
failure detection processing performed in the
10   operations panel 3.

With reference to Fig. 14, an operation
checking signal, which indicates predetermined
operation checking information for checking
operations, is sent from the base block 31 to
15   the display operations block 34 in step S511. In
step S512, the control section 311 analyzes a
response sent from the display operations block
34 in response to the operation checking signal,
and saves the analysis result in the memory
20   section 312 as a status information item of the
display operations block 34. Then, the
processing proceeds to step S513.

In step S513, the control section 311
determines whether the response from the display
25   operations block 34 is normal based on the

analysis result. If the control section 311 determines that the response is normal (Yes in step S513), the control section 311 orders a predetermined operation (normal operation),

5   which is to be performed when the display operations block 34 is in a normal situation, in step S514. Then, the processing proceeds to step S516.

If, on the other hand, the control

10   section 311 determines that the response is not normal (No in step S513), the control section 311 orders a predetermined operation, which is to be performed when the display operations block 34 is in an abnormal situation, in step

15   S515. Then, the processing proceeds to step S516.

In step S516, an operation checking signal, which indicates predetermined operation checking information for checking operations, is sent from the base block 31 to the second

20   operations block 33. In step S517, the control section 311 analyzes a response sent from the second operations block 33 in response to the operation checking signal, and saves the analysis result in the memory section 312 as a

25   status information item of the second operations

block 33. Then, the processing proceeds to step
S518.

In step S518, the control section 311
determines whether the response from the second

5   operations block 33 is normal based on the
analysis result. If the control section 311
determines that the response is normal (Yes in
step S518), the control section 311 orders a
predetermined operation (normal operation),

10   which is to be performed when the second
operations block 33 is in a normal situation, in
step S521. Then, the processing proceeds to step
S521.

If, on the other hand, the control

15   section 311 determines that the response is not
normal (No in step S518), the control section
311 orders a predetermined operation to be
performed when the second operations block 33 is
in an abnormal situation in step S520. Then, the

20   processing proceeds to step S521.

In step S521, an operation checking
signal, which indicates predetermined operation
checking information for checking operations, is
sent from the base block 31 to the first

25   operations block 32. In step S522, the control

section 311 analyzes a response sent from the
first operations block 32 in response to the
operation checking signal, and saves the
analysis result in the memory section 312 as a

5.   status information item of the fist operations
block 32. Then, the processing proceeds to step
S523.

In step S523, the control section 311
determines whether the response from the first

10   operations block 32 is normal based on the
analysis result. If the control section 311
determines that the response is normal (Yes in
step S523), in step S524 the control section 311
orders a predetermined operation (normal

15   operation), which is to be performed when the
first operations block 32 is in a normal
situation. Then, the processing proceeds to step
S526.

If, on the other hand, the control

20   section 311 determines that the response is not
normal (No in step S523), the control section
311 orders a predetermined operation, which is
to be performed when the first operations block
32 is in an abnormal situation, in step S525.

25   Then, the processing proceeds to step S526.

In step S526, the control section 311
turns on/off the first status display section
35a, the second status display section 35b, and
the third status display section 35c based on
5   the corresponding status information items of
the first operations block 32, the second
operations block 33, and the display operations
block 34 held in the memory section 312. Then,
the processing returns to step S511 to repeat a
10 series of the operations described above.

In the above embodiment, the control
section 311 of the base block 31 functions as a
failure detecting unit in the appended claims.

If one or both of the first and second
15 operations blocks 32 and 33 fail, the control
section 311 of the base block 31 can also
function as an instruction unit that transmits
an LCD display switching request for displaying
selection items corresponding to the failed
20 operations blocks 32 and/or 33. Thus, even if
one or both of the first and second operations
blocks 32 and 33 have failed, all the functions
of the image forming apparatus 1 can be used as
in a normal situation without waiting for
25 repair/replacement of the failed part. Such a

configuration facilitates maintenance. If a failure occurs in the second operations block 33 removed so as to be used as a remote controller, all the functions are available from the display

5   operations block 34 remaining on the main body 2.

        The following describes an example of the processing performed by the control section 311 of the base block 31 of the operations panel 3 when the first operations block 32 is in an

10   abnormal situation with reference to Fig. 15. Fig. 15 is a flowchart showing an example of the processing performed in the operations panel 3 when the first operations block 32 is in an abnormal situation.

15   With reference to Fig. 15, in step S531, the control section 311 determines whether the first operations block 32 is operating normally based on the last status information item of the first operations block 32 held in the memory

20   section 312. If the control section 311 determines that the first operations block 32 is not operating normally (No in step S531), the processing is terminated. If, on the other hand, the control section 311 determines that the

25   first operations block 32 is operating normally

(Yes in step S531), the processing proceeds to step S532.

In step S532, information indicating the cause (low battery level, transmission

5   trouble, etc.) of the communications failure of the first operations block 32 is saved in the memory section 312 of the base block 31. At the same time, the control section 311 reports the failure to the user by turning on the first

10   status display section 35a of the failure display section 35 or by showing a notice indicating the cause of the failure on the LCD 346, of the display operations block 34.

In the flowchart of Fig. 15, if the

15   last status information item is not held in the memory section 312 because, for example, the image forming apparatus 1 has been just started, the processing proceeds to step S532 regardless of whether the first operations block 32 is

20   operating normally.

The following describes an example of the processing performed by the control section 311 of the base block of the operations panel 3 when the display operations block 34 is in an

25   abnormal situation with reference to Fig. 16.

Fig. 16 is a flowchart showing an example of the
processing performed in the operations panel 3
when the display operations block 34 is in an
abnormal situation.

5   With reference to Fig. 16, in step S541,
the control section 311 determines whether the
display operations block 34 is operating
normally based on the last status information
item of the display operations block 34 held in
10   the memory section 312. If the control section
311 determines that the display operations block
34 is not operating normally (No in step S541),
the processing is terminated. If, on the other
hand, the control section 311 determines that
15   the display operations block 34 is operating
normally (Yes in step S541), the control section
311 checks the information indicating the latest
battery level of the battery 349 of the display
operations block 34 held in the memory section
20   312 in step S542. Then, the processing proceeds
to step S543.

In step S543, the control section 311
determines whether the battery level is low. If
the control section 311 determines that the
25   battery level is low (Yes in step S543),

information indicating that the battery level of

the display operations block 34 is low or

information indicating the cause (unreadable

signals, out of remote control range, etc.) of

5   the communications failure of the display

operations block 34 is saved in the memory

section 312 of the base block 31 in step S544.

At the same time, the control section 311

reports the failure to the user by turning on

10   the third status display section 35c of the

failure display section 35 or by showing a

notice indicating the cause of the failure on

the LCD 346 of the display operations block 34,

and terminates the processing.

15   If the control section 311 determines

that the battery level is not low (No in step

S543), information indicating the cause

(unreadable signals, out of remote control range,

etc.) of the communications failure of the

20   display operations block 34 is saved in the

memory section 312 of the base block 31 in step

S545. At the same time, the control section 311

reports the failure to the user by turning on

the third status display section 35c of the

25   failure display section 35 or by showing a

notice indicating the cause on the LCD 346 of

the display operations block 34, and terminates

the processing.

The following describes an example of

5   the processing performed by the control section

311 of the base block 31 of the operations panel

3 when the second operations block 33 is in an

abnormal situation with reference to Fig. 17.

Fig. 17 is a flowchart showing an example of the

10   processing performed in the operations panel 3

when the second operations block 33 is in an

abnormal situation.

With reference to Fig. 17, in step S551,

the control section 311 determines whether the

15   second operations block 33 is operating normally

based on the last status information item of the

second operations block 33 held in the memory

section 312. If the control section 311

determines that the second operations block 33

20   is not operating normally (No in step S551), the

processing is terminated. If, on the other hand,

the control section 311 determines that the

second operations block 33 is operating normally

(Yes in step S551), the control section 311

25   checks information indicating the latest battery

level of the battery 339 of the second

operations block 33 held in the memory section

312 in step S552. Then, the processing proceeds

to step S553.

5   In step S553, the control section 311

determines whether the battery level is low. If

the control section 311 determines that the

battery level is low (Yes in step S553),

information indicating that the battery level of

10   the second operations block 33 is low or

information indicating the cause (unreadable

signals, out of remote control range, etc.) of

the communications failure of the second

operations block 33 is saved in the memory

15   section 312 of the base block 31 in step S554.

At the same time, the control section 311

reports the failure to the user by turning on

the second status display section 35b of the

failure display section 35 or by showing a

20   notice indicating the cause of the failure on

the LCD 346 of the display operations block 34,

and terminates the processing.

       If the control section determines that

the battery level is not low (No in step S553),

25   information indicating the cause (signals

unreadable by the second operations block 33,

out of remote control range, etc.) of the

communications failure of the second operations

block 33 is saved in the memory section 312 of

5   the base block 31 in step S555. At the same time,

the control section 311 reports the failure to

the user by turning on the second status display

section 35b of the failure display section 35 or

by showing a notice indicating the cause on the

10   LCD 346 of the display operations block 34, and

terminates the processing.

The following describes an example of

processing performed in response to the failure

detection processing performed in the operations

15   panel 3 with reference to Fig. 18. Fig. 18 is a

table showing a relationship between failures in

the operations panel 3, operations, and reports.

The control section 311 of the base

block 31 detects failures in the first

20   operations block 32, the second operations block

33, and the display operations block 34 by

decoding the responses sent from the first

control section 321, the second control section

331, and the third control section 341. Then,

25   the predetermined operations shown in Fig. 18

are performed according to the failures of the

operations blocks 32 - 34 while reporting the

failures to the user with the corresponding

reporting methods.

5   For example, if failures are detected

in the first operations block 32 and the second

operations block 33, selection items

corresponding to the first and second operations

blocks 32 and 33 are retrieved and displayed on

10   the display operations block 34 as soft keys

(see Fig. 4B) such that the functions of the

failed first and second operations blocks 32 and

33 can be used from the display operations block

34. The detected failures of the first and

15   second operations blocks 32 and 33 are reported

to the user by turning on the first status

display section 35a and the second status

display section 35b of the failure display

section 35 and by displaying a notice on the LCD

20   346 of the display operations block 34.

           If a failure is detected only in the

display operations block 34, input from only the

hard keys, i.e., the operation keys 327 and 338,

of the first operations block 32 and the second

25   operations block 33 are accepted such that basic

operations (e.g. operation of making one copy)
are available. The detected failure of the
display operations block 34 is reported to the
user only by turning on the failure display
5   section 35 and the third status display section
35c of the failure display section 35.

With the related-art techniques, if an
operations block remaining on the main body 2
fails, the functions of the failed operations
10   block cannot be used. On the other hand,
according to the above embodiment of the present
invention, if an operations block remaining on
the main body 2 fails, the functions of the
failed operations block remaining on the main
15   body 2 can be incorporated into the display
operations block 34, which is removable to be
used as a remote controller, such that all the
functions are available from the display
operations block 34 as in the normal situations.
20   If the operations block removed to be used as a
remote controller fails, the functions of the
operations block remaining on the main body 2
can be used.

Moreover, since the failure can be
25   detected at the operations block level, the

operations block that requires replacement can
be identified. This is favorable for repair
persons. This is also advantageous as an
appliance.

5   In related-art multifunction copy
machines, the main body control section 21 for
controlling the operations of the main body 2 is
connected to the control section 311 of the
operations panel 3 through a serial or a
10   parallel interface. In order to quickly perform
operations, e.g., of switching items or screens
shown on the displays such as the LCD 346, in
response to input from the operations block, a
data rate of at least tens of Mbps or higher is
15   required although the rate may vary depending on
the resolution and display area of the displays
(e.g. data for one image=500 Kb data, transfer
time=0.1 second; 500 K8/0.1)

          However, if a wireless interface, such
20   as infrared rays, is used, the data rate is
about tens of bps. Therefore, image information
cannot be handled. If such a related-art copy
machine includes the operations panel 3 of the
present invention, workload on the remote
25   controller can be reduced without changing

control methods employed in the main body.

In the above embodiments, an ID
(identification) may be assigned to each of the
operations blocks 32 - 34 of the operations

5   panel 3 so as to implement an order of
priorities. By assigning IDs, two or more
operations blocks having the same functions can
be used at the same time.

The present application is based on

10   Japanese Priority Application No. 2005-039020
filed on February 16, 2005, with the Japanese
Patent Office, the entire contents of which are
hereby incorporated by reference.

15   <u>INDUSTRIAL APPLICABILITY</u>

The operations panel of the present
invention can be removably attached to an
electronic apparatus, such as an image forming
apparatus, and remotely control the electronic

20   apparatus when removed therefrom, while
providing improved operability.